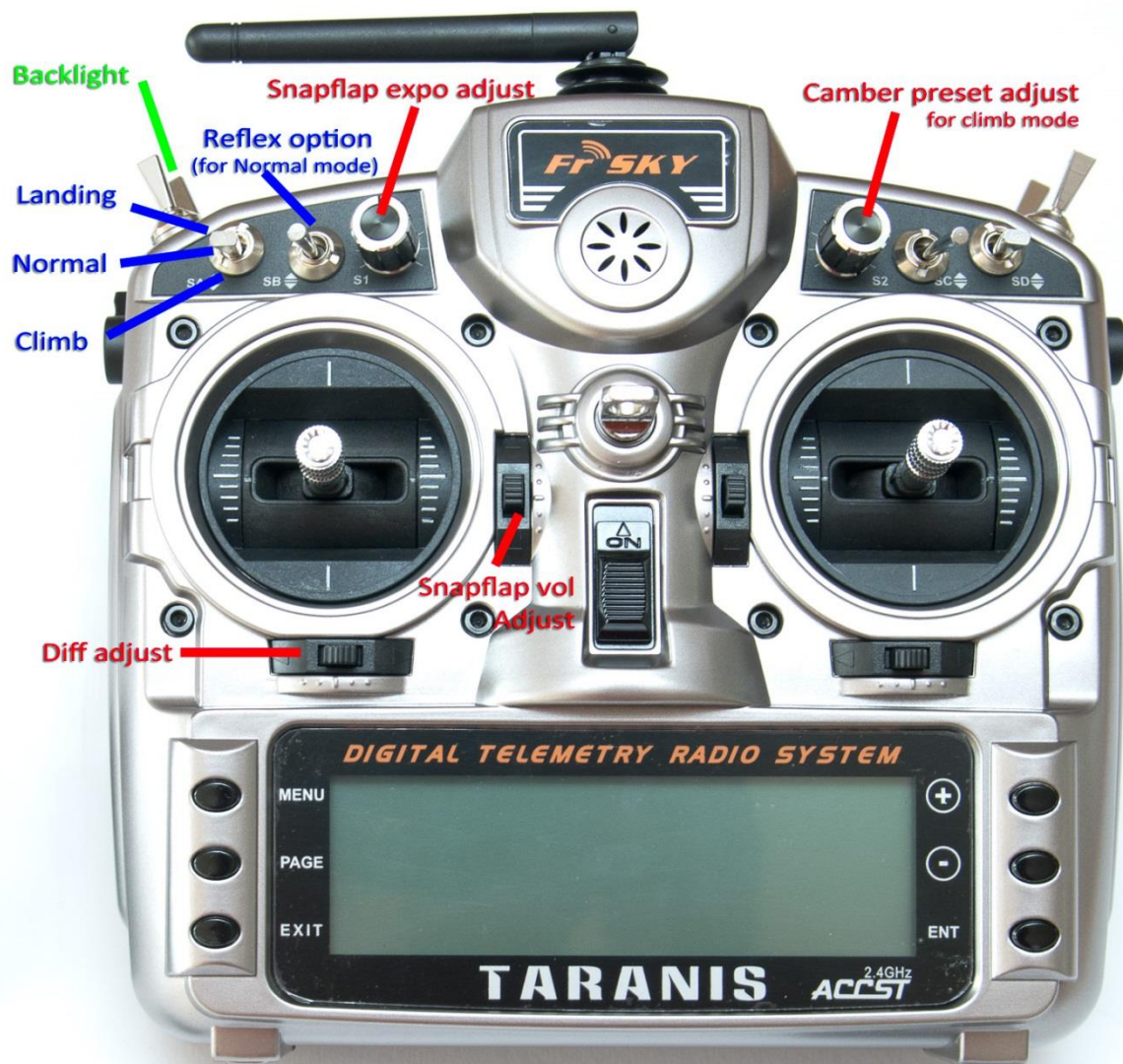


F3F Setup for Taranis

Version 2.01

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Introduction

The Taranis is an amazingly flexible radio, but this flexibility comes at a cost: it can be quite tricky to program. This aim of my F3F recipe is to enable Taranis owners to enjoy a competition-proven setup for their full house gliders, without the hassle of programming from scratch.

The setup has been refined over several years of competition in the UK league, and is designed for ease of flying as well as ease of adjustment of key trimming parameters.

Main specifications

- Supports 6-servo gliders with V-tail
- Flight modes: Normal, Climb, and Landing. Selectable via 3-position switch
- Reflex option for Normal flight mode, selectable via a 2-position switch

In-flight adjustments (for trimming)

- adjustable snapflap volume
- adjustable snapflap expo **(new)**
- adjustable aileron diff
- adjustable camber preset

Advanced mixing

- Aileron differential suppression
- Spoiler compensation with multi-point curve
- Coupled ailerons and rudder (combi)
- Mixers linked to flight modes

Other

- Full travel can be employed on flap servos (even if flap travel is asymmetric)
- Balancing curve for flaps ensures accurate tracking
- 'Calibration' mode for adjusting servo centres and limits **(new)**
- Step-by-step instructions **(new)**
- Experimental cross tail version included **(new)**

Pre-requisites

A good working knowledge of OpenTx is needed, including menu navigation and data entry. You'll also need to know how to transfer model setups to your transmitter using Companion9X. Please also read through this manual once through carefully before commencing.

Files provided

Filename	Description
F3F_v201_instructions.pdf	This document
F3F_v201_reference.xls	Menu settings reference
F3F_v201_setup.eepe	Eeprom image for Companion 9X
anormal.wav	Sound files for flight modes
areflex.wav	
alanding.wav	
aclimb.wav	

Flight modes

Four flight modes are provided, selected via switches SA, SB:

SA	SB	Flight Mode no./name	Mixers active
down		#3 CLIMB	Camber (via S2)
middle	Up	#0 NORMAL	Snapflap
	Down	#4 REFLEX	Snapflap, Reflex
Up		#2 LANDING	Spoiler

The scheme was designed to be as pilot friendly as possible. During the flight, the pilot only needs to use the main flight mode switch (SA). For windy conditions, reflex can be preselected before flight (SB).

Sticks and widgets

The setup supports both Mode 1 and Mode 2 operation. Widgets are assigned as follows:

Widget	Function
Rudder trim (TrmR)	Diff adjust
Throttle trim (TrmT)	Snapflap volume
S1	Snapflap expo
S2	Preset camber adjust (climb mode)
SF	Backlight

‘Calibration’ mode

A special CAL (*calibration*) flight mode is included solely for setting up servo limits and centres. CAL takes priority over all other flight modes. When CAL mode is enabled, all mixing and trims are ignored, allowing the servo centres and limits to be visualised. To enable CAL:

1. Apply full left aileron and full up elevator
2. Press SH
3. Release SH
4. Release sticks

When CAL is enabled, the tx emits a chirp every 5 seconds.

To exit CAL mode, press SH again.

Using Companion 9X

If using Companion9X to familiarise with the setup:

- To make it easier to navigate the mixers, check “Show channel names in mixers” option the editing screen.
- The default servo end points have been set conservatively for calibration on a real model. If familiarising in C9X, go to the LIMITS menu and set *MAX* = 100 and *MIN* = -100 on all servo channels.

Setting up the radio

All adjustments should be made in sequence, and tick boxes are provided for recording your progress.

Before you start

- ☐ Copy the flight mode sound files to the /SOUNDS/[lang] folder of the Taranis's microSD card.
- ☐ Copy the *F3F V2* model from the supplied EEPE file to your Taranis EEPROM.
- ☐ Perform a hardware stick calibration (*MENU long press → CALIBRATION*).

STEP 1 - Calibrate Flap servos and set up the Spoiler

Let's start with the most difficult task - calibrating the flap servos. By 'calibrating', we mean setting direction, centre and end points of each servo. We'll use the special CAL flight mode for this.

If you follow the steps to the letter you'll be rewarded with a linear, properly balanced setup which will make you the envy of your Futaba and JR toting friends!

Step 1.1 - Calibrate flap servos (CHs 3,4)

- ☐ Switch on the transmitter (don't switch on the receiver just yet)
- ☐ If you previously altered the flap balancing curve (curve 3), first reset it to the default 45 degree line
- ☐ Enable *Cal* flight mode
- ☐ Move throttle stick to centre
- ☐ Switch on the rx. The flaps will probably settle at between neutral and 30 degrees down
- ☐ Enter the *SERVOS* menu
- ☐ Check that *SERVOS → SUBTRIM MODE* = '^' (rightmost column)
- ☐ Check servo directions: Gradually move the throttle stick forwards i.e. UP. Both flaps should move UP (***note this is the reverse of the way spoiler will eventually work!!***) If either flap moves *down*, reverse the direction in *SERVOS → DIRECTION*.
- ☐ Set the end points for the flap servos. These are 'never exceed' positions, i.e. *the furthest the servos can travel before damaging the linkages*. Don't be too conservative with these adjustments, otherwise you'll restrict yourself later. Steps for each servo:
 - ☐ Move the throttle stick fully forward (UP). The servo will move up. Adjust *SERVOS → MAX* until the linkages just start to bind. Back off a little.
 - ☐ Repeat step above, moving stick fully BACK (DOWN), and adjust *SERVOS → MIN* to set down travel.
- ☐ Adjust *MAX* and *MIN* again, so the *end points* of the flap surfaces *match exactly*. This may mean reducing one or two values that you set above. In practice, you'll probably want to do this step concurrently with the previous step.
- ☐ Move the throttle stick forwards and back. Note how the movement of the flap is non-linear. We're going to fix that in the next step.

- ☐ Now turn your attention to adjusting the servo centres. The goal of this step is for the flaps to move linearly with respect to the throttle stick. The adjustments in this step are done without visualising. For each flap servo, simply set *LIMIT*→*SUBTRIM* to the average of MIN and MAX. So, for example, if a servo has *MIN* = -80 and *MAX* = +20, then set *LIMIT*→*SUBTRIM* to -30 for that servo.
- ☐ Move the throttle stick forward and back, and check that the flaps are now moving reasonably linearly with respect to the throttle stick.
- ☐ OK, now you're going to finalise the servo centres. Move the throttle stick to the centre (16 clicks from top or bottom). The flaps will probably not be in line (unless you're lucky!). No worries, just make a mental note of the *average position*. Now adjust *LIMIT*→*SUBTRIM* for each servo, so the flaps move to the average position, in line with each other. Don't worry that the flaps don't line up with the trailing edge - we'll correct that later when we set the spoiler offset.
- ☐ At this point, the flaps should match up perfectly when the throttle stick is in 3 positions: fully forward, centre, and fully back. Check now.
- ☐ Move the throttle stick back and forth again slowly; this time check that the flaps match each other at the flap neutral position - if tracking isn't good at that point, then you may get better tracking by adjusting the ¼ and/or ¾ points, by fine-tuning points 2 or 4 of the RtFlpBal curve.
- ☐ Finally, double-check the tracking by moving the throttle stick back and forth once more.
- ☐ Exit CAL mode

OK, that's the servo calibration done. Not so bad, was it?!!

Step 1.2 - Set spoiler movement

Now that you've got nicely tracking flap surfaces, setting up Spoiler is going to be a piece of cake!

- ☐ Select *Landing* mode
- ☐ Enter the *MIXER* menu, and scroll down to CH11 (FlapCm)
- ☐ Highlight Spoilr input and open the mixer editing screen. The *wt* parameter sets the total travel of the spoiler relative to the available servo travel. Start with say between 60% and 80%. Don't worry about over-driving the servos - you've calibrated the servos so they'll stop dead before doing any damage.
- ☐ Push the throttle stick fully forward (= spoiler off).
- ☐ Now adjust the mixer *offset* parameter so that the flaps go to the correct neutral position (i.e. in line with the trailing edge of the wing profile). Repeat this and the previous step until you have the movement required and the flaps go to neutral correctly with spoiler off.
- ☐ While still in the mixer editing menu, select NORMAL flight mode, and check that flaps remain in the neutral position.
- ☐ Exit the mixer editing menu

STEP 2 – Calibrate aileron servos (CHs 1, 2)

Relax - calibrating the aileron servos is going to be easy! Just one thing to note: in CAL mode **both ailerons move in the same direction, i.e. like flaps** - this may sound weird, but it makes it easier, as you'll see. Here goes:

- ☐ Enable CAL flight mode
- ☐ Go to the *SERVOS* menu
- ☐ Check that *SERVOS*→*SUBTRIM MODE* is set to '^' (it's in the right-most column)
- ☐ Check the direction of the servos: as you move the aileron stick to the *RIGHT*; both ailerons should move *UP*. If either aileron moves *down*, reverse the direction of the corresponding servo in *SERVOS*→*DIRECTION*.
- ☐ Adjust servo centres in *SERVOS*→*SUBTRIM*, so ailerons line up with the trailing edge of the wing.
- ☐ Set the end points of the aileron servos. These will correspond to the 'never exceed' positions of the control surfaces, i.e. *the furthest the ailerons can travel before damaging the linkages*. Don't be conservative with these adjustments; otherwise you'll restrict yourself later. Here's how to do it:
 - ☐ Move the aileron stick fully to the *RIGHT*
 - ☐ For each servo, increase *SERVOS*→*MAX* until the linkage just start to bind in the *up* position, and then back off slightly.
 - ☐ Repeat, this time push the aileron stick fully *LEFT*, and adjust *SERVOS*→*MIN* so linkage just starts to bind as the aileron goes *down*. Back off slightly.
- ☐ For each aileron re-adjust *MIN* and *MAX*, **so that down and up travel are the same**. You will need to back off some of the adjustments that we set above.
- ☐ Finally, **equalise the travel on both ailerons**, while still maintaining **the equal up/down** travel. Again, this will mean backing off some adjustments.
- ☐ Check, and check again: remember, **equal up/down, and both sides match!!**
- ☐ Exit CAL mode.
- ☐ Check the ailerons move like ailerons. Don't adjust the travel just yet, you'll do that in Step 4.

NOTE FOR ADVANCED USERS: the calibration procedure above assumes that sufficient down-movement is available on each aileron to perform the calibration. If the down-movement is limited (e.g. by top hinge), then you can specify some differential for the calibration. This will not restrict your diff choices when flying, it's simply a convenience *when calibrating*.

The menu points for setting calibration diff are as follows

MIXER→LtAil(CH01) →CAL→diff.
MIXER→RtAil(CH02) →CAL→diff.

E.g. if you set calibration diff to +50, then you can calibrate so that down movement = ½ up movement on each aileron.

STEP 3 – (V-TAIL version only) Calibrate V-tail servos (CHs 5,6)

- ☐ Calibrate the V-tail servos, following the same steps as above for the aileron servos, but with the following difference: Pushing UP on the elevator stick, should result in both surfaces moving *UP* (yes, **this is the opposite of normal operation, it's just for calibration!**). If either tail surface moves *down*, reverse its servo by setting *SERVOS* → *DIRECTION* to 'INV'.

STEP 3A – (X-TAIL version only) Calibrate Rudder (CH 5)

- ☐ Enable CAL flight mode
- ☐ Go to the *SERVOS* menu
- ☐ Check that *SERVOS* → *SUBTRIM MODE* is set to '^' (it's in the right-most column)
- ☐ Check the direction of the servo: as you move the rudder stick to the *RIGHT* the rudder should move to the right. If it moves to the *left*, reverse the direction of the servo in *SERVOS* → *DIRECTION*.
- ☐ Adjust servo centre in *SERVOS* → *SUBTRIM*, so that rudder centres correctly.
- ☐ Set the servo end points. These will correspond to the 'never exceed' positions of the rudder, i.e. *the furthest the rudder can travel before damaging the linkage*.
 - ☐ Move the rudder stick fully to the *RIGHT*
 - ☐ Increase *SERVOS* → *MAX* until the linkage just start to bind, and then back off slightly.
 - ☐ Repeat, this time push the rudder stick fully *LEFT*, and adjust *SERVOS* → *MIN* so linkage just starts to bind. Back off slightly.
- ☐ Finally, **equalise rudder travel on both sides**. You will need to back off either *MIN* or *MAX*.
- ☐ Exit CAL mode.

STEP 3B – (X-TAIL version only) Calibrate Elevator (CH 6)

- ☐ Calibrate the Elevator servo, following the same steps as above for the rudder servo, but with the following difference: Pushing UP on the elevator stick, should result in the elevator servo moving *UP* (yes, **this is the opposite of normal operation, this is only for calibration mode!**). If the elevator moves *down*, reverse its servo by setting *SERVOS* → *DIRECTION* to 'INV'.

STEP 4 – Adjust control travel and mixing

This is where your plane comes to life!

Perform the remaining steps in the order shown. Refer to the Excel spreadsheet if necessary.

Control / mix	Adjustment point	Adjustment procedure
Primary mixes		
<input type="checkbox"/> Ail→Aileron	STICK→Ail	Adjust travel, add lines per flight mode as required
<input type="checkbox"/> Ele→Elevator	STICK→Ele	<i>As above</i>
<input type="checkbox"/> Rud→Rudder	STICK→Rud	<i>As above</i>

Mixes to AILERONS		
<input type="checkbox"/> Spoiler→Aileron	MIXER→AilCm(CH10)→Spoilr	Enable LANDING mode and deploy full spoiler. Adjust <i>wt</i> to set up-aileron movement
<input type="checkbox"/> Max snapflap volume	MIXER→AilCm(CH10)→Snap	Enable NORMAL mode and move throttle trim to minimum (down). Adjust <i>wt</i> for maximum snapflap. Enable REFLEX mode and repeat.
<input type="checkbox"/> Max camber	MIXER→AilCm(CH10)→Camber	Enable CLIMB mode. Rotate S2 fully CW. Adjust <i>wt</i> (-ve) for maximum camber.
<input type="checkbox"/> Reflex	MIXER→AilCm(CH10)→Reflex	Select REFLEX mode. Adjust <i>wt</i> (+ve) for required reflex.
Mixes to FLAPS		
<input type="checkbox"/> Aileron→flap	GVARs→GV5	Adjust per flight mode
<input type="checkbox"/> Max snapflap vol	MIXER→FlapCm(CH11)→Snap	<i>As corresponding aileron mix</i>
<input type="checkbox"/> Max camber	MIXER→FlapCm(CH11)→Camber	<i>As corresponding aileron mix</i>
<input type="checkbox"/> Reflex	MIXER→FlapCm(CH11)→Reflex	<i>As corresponding aileron mix</i>
Mixes to ELEVATOR (note different adj. points for VTAIL and XTAIL)		
<input type="checkbox"/> Spoiler→Ele compensation	(VT) MIXER→VeeCm(CH13)→Spoilr (XT) MIXER→Elev(CH05)→Spoilr CURVE→SpComp	Enable LANDING mode. Adjust <i>wt</i> in Spoilr line to set overall elevator compensation. After flight tests, adjust SpComp curve to tweak response.
Mixes to RUDDER (note different adj. points for VTAIL and XTAIL)		
<input type="checkbox"/> Combi rudder	(VT) MIXER→VeeAlt(CH12)→Ail (XT) MIXER→Rudd(CH06)→Ail	Enable NORMAL or REFLEX mode. Adjust <i>wt</i> to set amount of combi.
In-flight adjustments		
<input type="checkbox"/> Snapflap volume	Throttle trim	Adjust separately for NORMAL and REFLEX modes.
<input type="checkbox"/> Snapflap expo	Adjust via S1	Select NORMAL or REFLEX mode, adjust in flight.
<input type="checkbox"/> Camber (S2)	Adjust via S2	Adjust in flight in CLIMB mode.
<input type="checkbox"/> Aileron Diff	Rudder trim	Adjust in flight per flight mode. Default range is 20 - 60% (CH15).

Reversing spoiler operation

The default spoiler idle position is *throttle stick forward*. If you prefer to fly with spoiler reversed, then open the mixer editor for MIXER→Spoilr(CH16)→Thr, and change *wt* from +100 to -100.

Pre-flight checks / disclaimer

Pretty obvious really, but worth repeating: although this setup is well tested, it's up to the pilot to make sure that the controls respond correctly under all conditions. I can't be held responsible for any bugs in the setup or documentation, so please remember to test your setup thoroughly before flying!

Change log

Changes from v2.00

- Changed some mixer default values in .eepe file
- Aileron trim behaviour changed to 'global' across flight models
- Included experimental X-tail version
- Default servo end points reduced to +/-30% to prevent overtravel before calibration

Feedback

If you like the setup, or have any queries or suggestions, or if you find interesting ways to extend it, I'd love to hear from you. You can reach me at <http://rc-soar.com/email.htm>.

Happy flying! – Mike Shellim